

GOVERNOR'S CONFERENCE ON SMART GROWTH/SMART ENERGY

Climate Change Adaptation

DECEMBER 12, 2008

ANNUAL GHG EMISSIONS

- ▶ **Approximately 27 billion metric tons of CO₂ was emitted worldwide via fossil-fuel burning in 2005**

ANNUAL GHG EMISSIONS

- ▶ **IN USA: 7.2 gigatons* in 2005 to 9.7 gigatons in 2030**
- ▶ **Coal-fired power plants emitted about 1/3 of all U.S. carbon dioxide emissions in 2005**
- ▶ ***1 gigaton = 1 billion metric tons**

CARBON ABSORPTION

- ▶ **By the oceans:** The oceans have absorbed approximately $\frac{1}{2}$ of all CO₂ emitted over the past 200 years (118 billion metric tons).
- ▶ **Ability to absorb CO₂ is decreasing**

CARBON ABSORPTION

- ▶ **By U.S. forest and agriculture land:**
After 50 years of increase, now projected to decrease from 1.1 gigatons in 2005 to 1.0 gigatons in 2030.
- ▶ **In New England: rural agriculture & timber land is converted to residential & commercial land at 1,742 acres per week**

In Massachusetts

- ▶ **Massachusetts has 2.2 % of the national population and emits approximately 1.3% of the GHG nationally (14.9 metric tons/person) ***
- ▶ **If Massachusetts was a country, it would rank 15th among industrial nations (below Greece but above Portugal)**

***national average is
24.9 metric tons per person**

In Massachusetts

▶ 97% of GHG originate from fossil fuel consumption*

*37% from transportation

*26% from electric power generation

*37% from “other”

Projected Changes in Climate

- ▶ Models by the IPCC (Intergovernment Panel on Climate Change) and the NECIA (Northeast Climate Impacts Assessment)
- ▶ All depends on GHG emissions:
 - CO₂ at 380 ppm (current level)
 - Over the next few decades, temperatures will increase 2.5° to 4.0° in winter and 1.5° to 3.0° in summer.

- CO₂ at 550 ppm (Lower Emission Scenario)
 - By the end of the century temperatures will increase 5.0° to 8.0° in winter and 3.0° to 7.0° in summer.

- CO₂ at 940 ppm (Higher Emission Scenario)
 - By the end of the century, temperatures will increase 8.0° to 12.0° in winter and 6.0° to 14.0° in summer.

ENVIRONMENTAL IMPACTS

Precipitation

- ▶ Total precipitation will increase 10% (4 inches per year) under either scenario.
- ▶ Winter precipitation (mostly in the form of rain) will likely increase 20% under the lower scenario to 30% under the higher scenario by the end of the century.
- ▶ Less snowpack will decrease the amount of infiltration to ground water.
- ▶ Estimated 14% increase in CSO activity

Extreme Precipitation

Under both scenarios, precipitation intensity will increase in 8% - 9% by mid-century and 10% - 15% by the end of the century.

The number of intense storms will increase 8% by mid-century and 12% - 13% by the end of the century.

Boston will experience a “100-year storm” once every three years under the lower scenario and once every two years under the higher scenario by mid-century.

Sea Level Rise

- ▶ **Global sea level rise: 7 to 14 inches under the Lower Emission Scenario and 10 to 23 inches under the Higher Emission Scenario.**
- ▶ **In Northeast: If recent trends continue, 6-inches predicted by end of century.**
- ▶ **Significant erosion and damage due to storm surge expected.**

Available Tools

- ▶ Regulations
- ▶ Policies
- ▶ Grants/loans
- ▶ Partnerships
- ▶ Education & Outreach
- ▶ Enforcement

Strategy

- ▶ **Cease the environmental insult at the source**
- ▶ **Clean up past insults**

Source of Pollution

- ▶ **Local**
- ▶ **We have legal authority to regulate pollution source**
- ▶ **The pollution source is usually commercial/industrial**
- ▶ **Many of the pollutants are visible**
- ▶ **Impacts are directly attributed to source**
- ▶ **Regulating a relatively few sources resulted significant benefit**
- ▶ **Regulation is “after the fact”**

Features of CO₂ Pollution

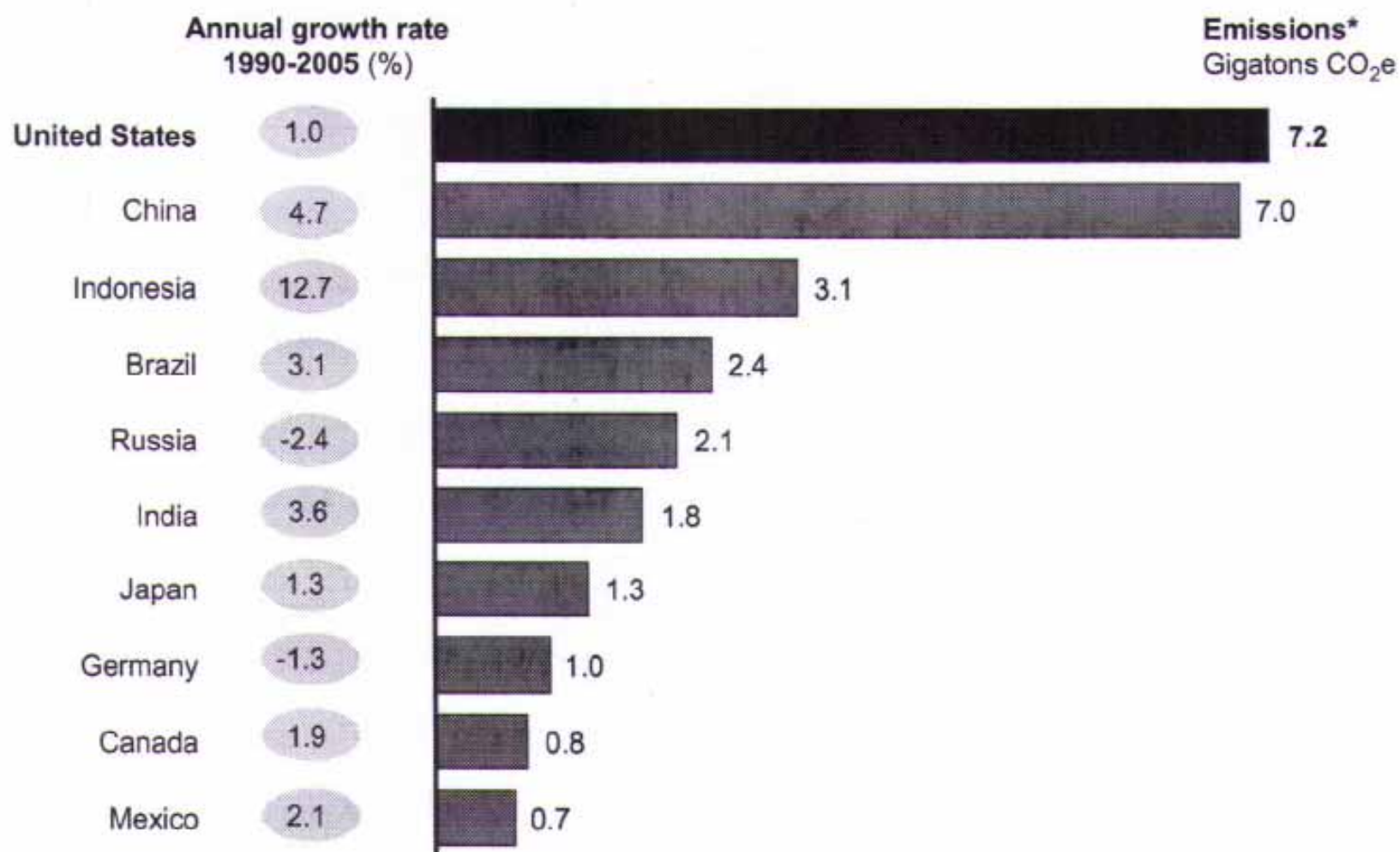
- ▶ Mostly from non-local sources
- ▶ We have no legal authority to regulate pollution source
- ▶ The pollution source is only partially from commercial or industrial sources
- ▶ CO₂ is invisible
- ▶ Difficult to attribute impacts to source
- ▶ Regulating a relatively few sources would not have significant benefits
- ▶ Involves regulating impacts that haven't occurred yet

Features of CO₂ Pollution

- ▶ Mostly non-local sources
- ▶ We have no legal authority to regulate pollution source

Exhibit 1

GHG EMISSIONS FOR SELECT COUNTRIES – 2005



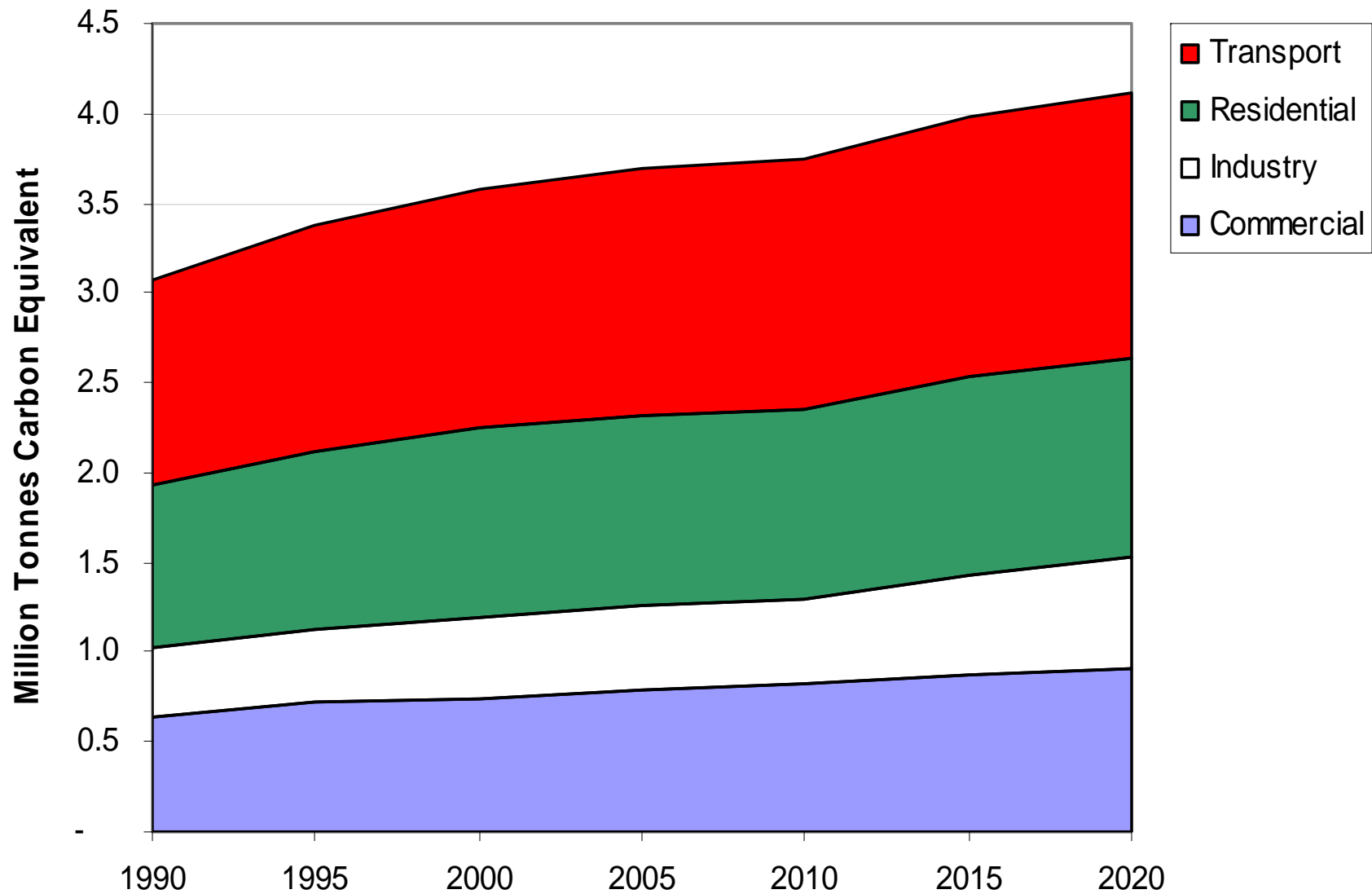
* Includes emissions associated with deforestation and land-use changes

Source: IEA; EPA; WRI; UNFCCC; McKinsey analysis

Features of CO₂ Pollution

- ▶ The pollution source is only partially commercial or industrial

Projecting a Baseline by Sector



Features of CO₂ Pollution

- ▶ CO₂ is invisible

Features of CO₂ Pollution

- ▶ **Difficult to attribute impacts to source**

Features of CO₂ Pollution

- ▶ Regulating a relatively few sources would not have significant benefits

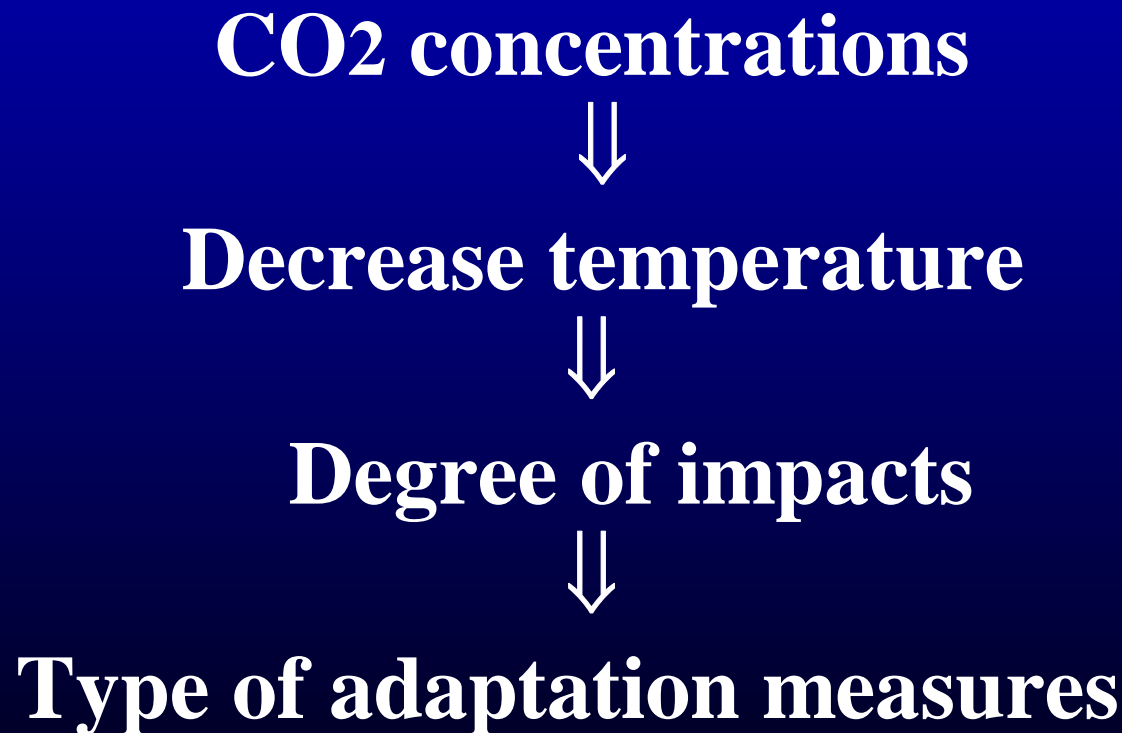
Features of CO₂ Pollution

- ▶ Involves regulating impacts that haven't occurred yet

**So what can MassDEP do for
climate change adaptation?**

Mitigate, Mitigate, Mitigate

- ▶ What we willingly do now will determine what we'll have to do later.



What else?

- ▶ Continuing doing many of the things we are doing now.
- ▶ Consider climate change impacts in all our future regulations, regulation changes, and policies.
- ▶ Partner with other agencies, non-profit organizations, and businesses.
- ▶ Be prepared to make tough decisions.

